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## ORIGINAL ARTICLES.

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### HOW TO AVOID SECONDARY OPERATIONS AFTER CATARACT EXTRACTION.\*

BY C. BARCK, M.D.

ST. LOUIS.

THE endeavors, in cataract, to reestablish useful vision by one operative procedure are old. Unhappily the ideal method—removal of the lens in the capsule—as aimed at by Pagenstecher and others, can, up to the present time, be safely accomplished by no proposed technique.

Some years ago, the cystotome was replaced by the capsule forceps, which is still used by many operators. Others, among them myself, have again discarded the latter, partly because the results were not much more certain than with the former and partly on account of some dangers connected with its use. But one of the objects in selecting this theme was to hear the views of those present on this instrument and to find out how much it is in use to-day and with what success.

The oldest method of dealing with the capsule was a crucial incision in the pupillary area, which often opened it imperfectly, so that capsular cataracts were frequent. Then Knapp introduced about 14 years ago his "peripheric horizontal incision" in the upper third of the capsule. Secondary operations became still more frequent. This was to be expected since the larger part of the capsule, the lower two-

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thirds, remains intact *in situ*. Knapp, with his method, accepts the necessity of the secondary operation as the rule rather than the exception. In his second series of a hundred cases of simple extraction, he performed discission in 74 instances (*Archives of Ophth.*, 1889). The immediate result, as regards the vision, was not once equal to  $\frac{20}{20}$ ; after discission it increased to  $\frac{20}{20}$  in 30 cases. In his third hundred (*Archives of Ophth.*, 1890) he made a secondary operation 53 times. By the primary operation he secured a vision of  $\frac{20}{20}$  in only one case; by the secondary this was obtained in 20 additional ones. But Knapp adds that he feels certain that many cases of this series would present themselves for secondary operation later on.

I had practised the peripheric horizontal incision for a number of years before I gave it up on account of the number of secondary operations which it necessitated. I need not dwell here on the inconveniences which they cause, especially in patients living at a distance, who must come a second time to the city. Furthermore, although it is small, still there is a certain amount of danger connected with discission. From my personal experience I recall one case of a glaucomatous attack following discission which, however, subsided without any permanent damage. Others report similar consequences; still others, acute or subacute irido-cyclitis, with its dire sequelæ.

About three years ago I abandoned this method, and have gradually developed the one which I now use. It is a return to the old method, with some modifications. I lay the main stress on a long, vertical incision, commencing inferiorly, going with the cystotome between the iris and the lens capsule downward to the very periphery of the lens and dividing by an upward movement the lens capsule as extensively as possible. At first I added to this a horizontal incision both right and left. In order to simplify the procedure and to reduce the strokes of the cystotome to two, I devised the following method. The first incision is of a crescentic shape, commencing laterally from the lower end of the vertical meridian; the second one commencing just as far mesially from this, meets the first somewhat above the center of the capsule. (See drawing). It is very important that the two incisions

really intersect. If correctly carried out, the lower triangular flap as a rule falls downward, and the upper portion retracting, leaves a clear, central pupillary area.



In a number of instances, the remnants of the capsule placed themselves so that they just filled out the coloboma left by the iridectomy. Such a result is of course beneficial both from a cosmetic as well as from an optical standpoint. In five of my last 50 cases I had to make a discission, that is in 10 per cent. In two of these the extraction had been followed by iritis causing a closure of the pupil. In the third, the patient had been dismissed with good vision; some months afterwards a severe infectious disease was followed by an iritis and, in consequence of want of proper treatment, by a closed pupil. The number of cases, therefore, where the obstruction was due to the capsule alone, is a very small one. After these very satisfactory experiences with this form of incision, I feel justified in recommending it to you for further trial.

#### DISCUSSION.

DR. ALT.—The advantage I can see in the incision of the capsule recommended by the essayist is that no upper capsular flap is formed which may become engaged in the corneal wound. This, however, can be avoided in other ways, especially by the peripheral capsulotomy, with vertical section added, as I always practice it. As ingenious as Dr. Barek's capsulotomy may be, I do not see how any form of incision in the anterior lens capsule can prevent a secondary cataract from forming and necessitating a secondary operation. It is not the anterior but the posterior capsule, in my experi-

ence, which by wrinkling and slight tissue-formation gives rise to what we term a secondary cataract. I fail, therefore, to see how this incision of the anterior capsule can be of value in preventing it. Nothing but the removal of the lens capsule can do so, and even then the formation of fine connective tissue threads may produce a quasi-secondary cataract. This, also, happens when, as Hasner recommended, the posterior lens capsule is incised as soon as the cataract has been expelled. I have often done this, and abandoned it, since it did not prevent the formation of a very thin membrane which obstructed the former opening and which undoubtedly resulted from the inherent injury to the anterior parts of the vitreous body. It seems to me that no method of extraction can insure against the necessity of a secondary operation, but surely no kind of incision in the anterior lens capsule can do so.

I should also think that Dr. Barck's incision leaving a pouch at the upper periphery of the capsule might interfere with an easy delivery.

DR. STILLSON.—I am in the habit of trying to make a round incision. My chief difficulty in my last fifty cases has been from a little membrane or veil which forms after the extraction of the cataract. This I take to be the remains of the posterior capsule of the lens or the hyaloid membrane which marks the anterior boundary of the vitreous. If the doctor will tell us how to get rid of this interference to vision I will take it as an especial favor. The opacity of the anterior capsule after an extraction is certainly an undesirable outcome to what we so often know to be a really good extraction; and I never liked the idea of leaving this for a secondary operation, so I have as a rule not only incised the capsule freely, but I always wash out the pieces and frequently go in after the capsule with forceps; but as before mentioned it is the deeper membrane which bothers me and which I never like to pierce with a knife if there is any way to avoid it.

DR. FISHER, Chicago.—Dr. Barck's paper is certainly very interesting, and anything that will add to that contribution will be very valuable. In a paper of this kind, that is of so much importance, I think that Dr. Barck should give us more details regarding the vision after operating. I am of

the opinion that his paper would be more valuable if he would group his cases and give us his results.

We do not know what vision Dr. Barek is satisfied with after a cataract operation. The operation is an ingenious one, and if Dr. Barek gets good vision in all his cases without a secondary operation, it is certainly a very valuable one. If we are satisfied with  $\frac{20}{30}$  or  $\frac{20}{40}$  or  $\frac{20}{50}$  of vision, we might in many cases avoid operation. I would like to ask Dr. Barek what he regards as sufficient vision to avoid secondary operation.

DR. HOTZ.—The only way to avoid secondary cataracts is to remove the lens within its capsule, no matter what ingenious incision you may make. It is not the anterior capsule which gives the most trouble. We find afterwards a fine veil spread over the pupil, and that is the posterior capsule, dusted over with fine deposits, as the result of some slight uveitis or hyalitis following the operation. No ingenious splitting of the capsule will avoid secondary operations.

DR. ROGERS.—This subject is very near to my heart on account of the attention given it by my associate, Dr. Clark, and I have made a rough diagram on the board which will illustrate a method devised by him about eight years ago and since then used by both of us when practicable. Two vertical incisions are made in the capsule on either side of the pupillary space, extending well towards the periphery; these are united by a cut that crosses their upper limit, extending three or four mm. beyond them, if possible, parallel with the periphery of the lens. In this way a flap is formed as Dr. Barek has illustrated, without the disadvantage of the lens occasionally rotating. Occasionally the little flap can be cut across below without undue traction or instrumentation, in which case the result is most satisfactory. I agree with Drs. Alt and Hotz that it is absolutely impossible to get a perfectly clear opening entirely free from even a diaphanous sheet unless the lens is removed in its capsule. But certainly the nearer we can come to it the better.

DR. GREENE, Dayton, O.—The ideal operation for the extraction of cataract, when we wish to eliminate all chance of a secondary operation, is to extract the lens within the capsule. The next method of operating, which at all ap-

proaches it in efficiency, is that of extracting the anterior leaf of the capsule. By this method we accomplish two things. We make the capsulotomy and avoid the secondary wrinkling and opacification of this portion of the capsule leaf so commonly seen a year or more after the extraction has been made. One or the other of these methods should always be employed in hypermature cataract, in operable cases of complicated and in all cases of traumatic cataracts where the capsule is thickened from inflammatory changes. For some time past, with the idea in view of so opening the capsule that it would by virtue of its elasticity withdraw from the pupillary area, and thus avoid, when possible, the necessity for a secondary operation, I have been opening the capsule by crossed incisions, using two cystotomes, one with its cutting edge parallel with the shank of the instrument, this to cut from below upward; the other with its cutting edge at a right angle with the shank, with which the lateral cuts are made. The result is a division of the anterior leaf into four sections, which have gotten out of the way in a very satisfactory manner in the limited number of cases in which I have followed the method. Next year I hope to have more to say about this method and the visual results obtained.

DR. BARCK (closing discussion).—In regard to what Dr. Alt has said, will say that I have never seen any difficulty in expressing the lens. On the contrary its delivery, with this section, is a very easy one. Furthermore, since I perform such an extensive laceration of the capsule, I do not recollect seeing a single prolapse of the vitreous.

As to the shriveling or shrinking of the posterior capsule, which becomes apparent only years after the extraction, this cannot be prevented, of course, by any form of capsular incision, but only by the extraction in the capsule. However, my paper plainly stated that it did not deal with these, but with the immediate secondary cataracts due to the presence of the anterior capsule within the pupillary area.

As a rule I am satisfied with a vision  $\frac{20}{30}$ , and would try to improve this degree by discission only under exceptional circumstances. In the instances where the vision was a lower one this was not due to the presence of the anterior capsule within the pupil.



ELECTRO-CAUTERY TREATMENT OF CORNEAL  
WOUNDS AND ULCERS.\*

By JNO. A. DONOVAN, M. D.,

BUTTE, MONTANA.

FROM the natural conditions of the city in which I live, mining and treating ores is the principal industry. In such occupations, corneal injuries are of the most frequent occurrence. In my ophthalmological work, conditions resulting from corneal injuries constitute a great portion of my practice; in fact, much more than any other disease.

With the laboring man, time is an essential feature in surgical treatment, as everyone desires treatment by the method with which can be obtained the best results in the least possible time.

Until within the last three years I treated all wounds and ulcers by cleansing and endeavoring to maintain asepsis, and stimulating whenever necessary. I faithfully used iodoform, later zeroform and nosophine. For local applications, when indicated, I curetted, used 1 per cent. sol. of formalin, pure phenol or tinct. iodine. With these, in most cases, satisfactory results were obtained; in others the reverse was true. In some obstinate cases, I secured nice results from the use of cassaripe in a 10 per cent. ointment, on which I reported in *Oph. Rec.*, Nov. '99. However, when all else had failed and not till then, I would resort to the use of the electro-cautery, which method of procedure I am led to believe after a visit to many of our Amer. Oph. hospitals, is still the common practice, i. e. using the cautery as a last resort. I asked myself the question: if these obstinate ulcers heal so nicely after using electro-cautery as the last resort, why not use it at first? The frequency in the use of the electro-cautery in my rhinological work has changed, with increased experience, in inverse proportion to its use in ophthalmological work.

The average simple non-infected corneal ulcer or wound will heal just as readily if it is simply protected, kept clean and let alone, as it would with the most energetic treatment. Therefore, the practice of many surgeons of touching all corneal abrasions with iodine or phenol or any stimulant is, to say

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the least, superfluous, not to mention the pain and reaction that always follows. As to the physiological explanation of the results obtained by use of the electro-cautery, there might be much said, but whatever its method of action, experience has taught its use in a great many cases is essential to get best results.

Most of my accident patients come from the mines or smelters with a piece of quartz in the cornea. There is no means of judging whether the speck is simply rock or contains irritating compounds of copper, arsenic, etc.; in others slight abrasions have already become serious by contamination with copper water, which is a concentrated solution of sulphate of copper that saps through the rock above and dripping down on the miner's head gets into his eyes. If the wound be but slight, I either give nothing or a boric acid and zinc wash, instructing the patient to return in 24 hours; if there then be any irritation, I lightly touch the spot with the cautery at a very dull heat. This is usually all the treatment required.

For nearly three years past, in all corneal ulcers, no matter what the origin, if they appear severe enough to require any further treatment than a mild cleansing lotion, I invariably, after putting in a few drops of holocain, clean out any excessive amount of necrotic tissue with curette and use the electro-cautery. The results have been more satisfactory, considering time, reaction and suffering, than I obtained with any other method of treatment. I use a current transformer on the light current and a short straight cautery point, placed in the handle at angle of 45°. The point is heated to a dull red in most cases, though in some I do not reach even the degree of red heat. In the ordinary cases, the lightest possible punctures are made all around the edge of the ulcer just in the edge of the healthy cornea, punctures being about 1½ mm. to 3 mm. apart; also, when necessary, I touch any part in its floor that appears unhealthy. This latter procedure greatly hastens the healing process if there is any necrotic or unhealthy spots in the floor, but if it appears clean, this should be omitted. With few exceptions, this is all the active treatment necessary. If after a few days (say two to four) some places appear to have made no progress, these spots



should be re-touched. In the rare cases in which the ulcer does progress in some direction, the advancing portion should again be touched by puncturing just in the edge of the normal tissue; this acts apparently in the same manner by which prairie fires are controlled by burning an area in front of them.

I claim no originality as to the method of corneal punctures at the edge of ulcers. I first received the suggestion of it from Dr. Herman Knapp. He later demonstrated the method before the Oph. Sec. of N. Y. Academy of Medicine, Nov. 1900, as reported in Vol. xxx, Archives of Ophthal. I quote a paragraph from a letter received from Dr. Knapp under date of New York, March 9, 1903. He says: "I have tried this method ever since, and used it almost to the exclusion of any other procedure. It is only lack of time kept me from publishing the results of the method, which are in general very satisfactory, frequently surprisingly good. I have dozens of carefully recorded cases in my record books and shall publish them as soon as I can make time for it."

With children, I formerly gave chloroform, but now use only local anaesthesia. Spots in the conjunctiva require more holocain than in the cornea. Cauterization can be accomplished perfectly by handling the cautery with the same precaution we use the cataract knife, and touching each spot instantaneously. A speculum or a fixation forceps is usually not necessary. With this treatment the child requires nothing more.

In wounds of the cornea, when it has been completely perforated, cut or lacerated, and probably not aseptic, I touch the entire margin of both edges of the wound. If in apposition, this coagulates any exudate and forms a protective covering; it at the same time cements the edges together. To illustrate: Patient aged 65; prospector; struck in a saloon with a broken beer bottle at midnight. Consulted me at four P. M. next day; found vertical cut extending from 1 mm. above to 1 mm. below sclero-corneal margin, including the entire center of the cornea; protrusion of the iris above and below. I cut off both protruding portions of the iris with scissors, then cauterized full length wound thoroughly; this practically sealed it. Patient left next day for his cabin in the hills,

taking with him only atropine solution. Saw him next in six months' time; had no more pain; made nice recovery and had useful amount of vision.

To illustrate results obtained in severe ulcerations: Mrs. B. aged 63; wash-woman; ulcer covering a third of cornea; hypopyon extending up to pupillary edge. At first visit in my office, I used cautery. She walked home and returned third day; pus had disappeared; no pain; simply kept eye covered. She made an uninterrupted recovery.

On the evening of the same, Mr. P. aged 55, mining engineer, consulted me; was injured two weeks previously. The local condition was nearly identical with that of Mrs. B. Used cautery; extension towards the center of the cornea stopped but extended toward the periphery. Three days later I touched the advancing edge and opened the anterior chamber. I repeated this three times within nine days. Then he entered the Murray & Freund Hospital and was put to bed; second day pus was gone and he resumed work three weeks later.

Girl aged 2 yrs.; corneal ulcer; treated with phenol once; later iodine twice; with continued use of drops, and nosophene ointment, fully recovered after two months. When ulcer suddenly recurred, I applied pure phenol but did not check its progress; on the third day, under chloroform, used electro-cautery. No more active treatment, and now after three years, there is but the faintest nebula, not perceptible to her parents. This being the first time I used it on a child, and several almost similar cases following, induced me to substitute local anæsthesia for chloroform, and use the cautery as primary treatment. The time consumed from making a diagnosis till the patient is operated on and leaves the office does not exceed 10 or 15 minutes.

To illustrate its use in apparently simple cases: A child with a mere abrasion caused by a finger nail, was brought to my office on account of pain. I prescribed holocain, but on third day being informed the mother was compelled to use it several times each night, I touched the spot with cautery point barely at the temperature where it burns cotton (this is the test I use to regulate a black heat). After three hours, pain was gone and no further treatment was used.

CONCLUSIONS:—Whenever a corneal wound or ulcer is se-

vere enough to require treatment, electro-cautery is indicated. With proper appliances in careful, competent hands, its effects are absolutely controlled and is perfectly safe with patients of any age. The results are better, quicker, more certain, with less reaction and much less pain than can be obtained by the use of phenol, iodine, formalin or other strong stimulant. The scar resulting is no more and frequently much less than would have resulted had any of the so-called less radical means been employed. I have used it in a great number of cases; so far I have penetrated through the cornea but twice, and then without any bad results, and I consider it in every respect one of the most satisfactory operations performed in ophthalmic surgery.

#### DISCUSSION.

DR. GAMBLE.—I think this is a very interesting paper. Dr. Donovan speaks of a solution of zinc and boric acid in treating these corneal ulcers. I would, myself, hesitate to use zinc in the treatment of a corneal ulcer. My experience is that we cannot use irritating substances, and our antiseptics are all more or less irritating. Zinc in my hands is a source of danger. I was glad to hear the essayist speak about the avoidance of scars. I have not been so fortunate. I think there is more danger with the actual cautery than with carbolic acid or nitric acid of producing scars. The action of these solutions is hindered by reaction of the tissues. With the proper use of carbolic acid or nitric acid, there are few ulcers we cannot control. It has been my experience that when the cornea is perforated it will take care of itself. I never have had occasion to cauterize the margins of wounds after perforation or incised perforating wounds. It might be that the infections from the mines would necessitate such treatment.

DR. SUKER.—The doctor is to be complimented on the excellence of his paper. He speaks of zinc sulphate and boric acid; they are chemically incompatible. I would ask if he has tried the use of nitric acid. It is a stimulant and a cautery at the same time. You can limit its action as nicely as you can the electro-cautery. I think the conclusions he draws are good. If the electro-cautery, as a last resort in some

cases does good, it would accomplish the same as the "first resort."

DR. BRADFELD.—I do not believe zinc sulph. should ever be used in corneal lesions, as it is very irritating, and when an astringent is needed one should be chosen over which we have better control. In superficial infections of the cornea I very much prefer fuming nitric acid to the actual cautery, as it is much less liable to leave opacities.

DR. CONKEY, West Superior, Wis.—While the electric cautery is an excellent remedy it has its limitations. It will not always stop the progress of rapidly spreading septic ulcers. I have lost some eyes by depending entirely upon it. In these malignantly destructive cases it should be combined with free incisions through the ulcer. The anterior chamber should be opened and kept open till the ulcer begins to heal. The fluid from the anterior chamber seems to exert a some powerful antiseptic action upon the diseased surface than does the cautery.

DR. G. F. KEIPER, Lafayette, Ind.—I believe that taking all in all, the galvanic cautery is the best means we have at present for treating corneal ulcers. I recently cauterized an eye and re-cauterized it, and the ulcer continued to spread, and I then used nitric acid and finally iodine. I also recall a case where I was obliged to cover the place with normal conjunctiva in order to prevent the escape of aqueous according to the method of Kuhnt. As a rule a burn in the cornea is easier to heal than an ulcer.

DR. M. D. STEVENSON, Akron, O.—It is most important in using the cautery to apply it only momentarily and then remove it, reapplying it as often as necessary, much depending on the efficiency of the apparatus. The aqueous will become heated and cataract result, if it is held too long in contact with the cornea. When the base of the ulcer is thin, often presenting a slight bulge as if it is going to rupture, it is well to perforate it with the cautery, thus reducing the tension of the eye, and keep the opening patent until the eye is much improved. I always instill a weak solution of fluoresceine into the eye to more clearly outline the ulcerated area. In ordinary round non-progressive ulcers I cauterize the area of first staining, but in one that is rapidly progressive in a

certain direction I also cauterize the area of second staining in the same direction, which extends 1 mm. or slightly more into the adjoining infiltrated cornea. A nervous patient should not be informed of its use, as through fear their co-operation may be lost and damage result. I have used nitric and carbolic acids, properly applied so that there was no excess to run over the cornea, much more frequently than the electro-cautery and consider that in ordinary cases they are as good and more easily and safely applied. The electro-cautery is not necessarily the best to use in all cases merely because it often is more useful in some of the severer types.

DR. JOS. TITCOMB, Duluth, Minn.—I believe cautery to be the best single agent we have. Personally I prefer the actual cautery by means of the platinum probe heated at the alcohol lamp. The cautery is the agent that does the work, and unless the ulcer is central, where there is possible danger of opacity, I almost invariably use it.

DR. HECKEL —I do not think any one doubts the efficacy of the electro-cautery treatment. I like to use carbolic acid in small ulcers. It gives very good results. In certain cases nothing will take the place of the cautery. This is especially true of the class of cases Dr. Donovan describes, where it is excellent treatment. The use of some germicidal agent in conjunction with the electro-cautery enhances its efficacy. I formerly used silver nitrate with good results, but now use protargol in solutions of 10 grs. to 20 grs. to the ounce. It is a good germicide and has a beneficial influence.

DR. J. W. SCALES, Pine Bluff, Ark.—I find that locality has a great deal to do with the result of treating corneal ulcers. I dare say that if the usual treatment was carried out in my part of the country that is usual in the hospitals of New York and other places, the majority of the eyes would be lost. I am speaking of the urgent case that comes to the specialist in that locality. In the first place, we have a man with a large spleen and cathectic diathesis, his liver inactive and in a general asthenic condition. Any sort of stimulation will be detrimental to that patient. You first have to rouse his secretion, and the best thing in Arkansas is calomel. I would not hesitate to give my patient, if the occasion were urgent, at least 20 to 25 grains of calomel in order to get an



immediate effect, that is, within a few hours. The average case would not, of course, take as large a dose. Until you get the slight reaction, which will be indicated by an increase in his appetite, which is the best indication we have of a stimulation in the liver, we are compelled to use palliative remedies. The best I think is hot applications. If we use the cautery we will get one result in one case and another in another. My patients do not pay enough attention to the diathesis.

DR. WILDER.—I concur with the propositions of Dr. Donovan in the main. I cannot agree to his ultimate conclusion that because this treatment is good as a last resort, it is good as the first in every case. I do not believe that we should use this rather severe treatment in such a simple thing as a scratch of the cornea from a child's finger. In the hands even of a skillful person, the cautery will make quite a scar, and wherever you burn the cornea you will have a scar; if that happens to be central it may interfere with vision. I do not believe we should resort to this before we have tried antiseptic irrigations, etc. I do agree with him on the value of the treatment, and I rely less and less on carbolic acid and nitrate of silver in these cases. One practical point is that when the corneal ulcer has extended deeply, there will be a little knuckle of the membrane of Descemet sticking up like a little pearl. One may cauterize the advancing border, but the keratocele will remain and prevent the healing of the wound. Not until a puncture is made through the keratocele will the process stop. As Dr. Stevenson has said, we relieve the tension in these cases and accomplish just what is done by the Sgemiş incision.

DR. DONOVAN (closing discussion).—I use zinc, one to two grains to the ounce only, as a rule, and in that proportion it is hardly a stimulant; it is but a mild astringent. It has been said that the perforating wounds usually take care of themselves. It is true, a great many of them do. I do not mean to say that you should use the cautery when the cornea seems to be doing all right. But if you know it is infected, it is not well to wait to have it demonstrated. I did use nitric acid on several occasions, and I have forgotten just what my results were. I use the electric cautery so fre-



quently that I think I can do better than with nitric acid. It is not necessary to cauterize to the bottom to stop the infection. As a rule, I make the slightest possible punctures. I cannot get these patients to go to bed. I think every one with a sore eye should go to bed, but I cannot get them there. In spreading ulcers it checks them as a rule. I just touch the ulcer with the cautery as lightly as possible — just touch it and withdraw. I do not use fluorescine any more. As a rule the patient has diagnosed the trouble and outlined the treatment, and if the ulcer is extensive enough to need treatment, it shows. I consider the electro-cautery safe, but not to be used too freely in the center of the cornea. Boracic acid and zinc sulphate I do not consider incompatible. It makes an absolutely clear solution and you get an astringent effect from it.

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#### TUBERCULOSIS OF THE IRIS, WITH PRESENTATION OF MICROSCOPIC SPECIMENS.\*

By WM. H. WILDER, M. D.,

CHICAGO.

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SOME difference of opinion seems to exist as to the frequency if this disease. Wagner (*Munch. Med. Woch.*, 1891, Nos. 15 and 16) states that 50 per cent. of all cases of iritis are of this character. Michel (*Lehrbuch der Augenheilkunde*) also regards it as very common, and states that forty or fifty of every hundred cases of iritis are tuberculous. Both authors seem to include in their category all cases of serous iritis in which there are small masses of exudate in or upon the iris, that simulate in any manner tuberculous nodules. Horner estimates that it will not be observed more frequently than once in four thousand cases of eye diseases, while Hirschberg, of Berlin, saw only six cases of it among sixty thousand eye cases.

Velhagen (*Klin. Monatsbl. f. Augenh.*, XXXII p. 121) says that among eight thousand patients in the Eye Clinic at

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Göttingen, no case of tuberculous iritis was seen. With these latter opinions I think most ophthalmologists will agree, and we must conclude, therefore, that it is a rare affection. Probably early observers who had opportunity for examining such cases, considered them as either condylomata or sarcomata, or placed them in the category of idiopathic iritis; but with the invention of the ophthalmoscope and the discovery that tubercles develop in the choroid in connection with either general or meningeal tuberculosis, a more careful study of certain inflammations of the iris and ciliary body has determined their exact nature. Cohnheim demonstrated that tuberculous iritis can be caused by introducing particles from tuberculous lymphatic glands, granulations of tuberculous joints, etc., into the anterior chamber of the eye. More recently investigators have caused the disease experimentally by injecting pure cultures of the tubercle bacilli into the aqueous chamber. The introduction of small masses of suspected tissue into the anterior chamber of the eye of a rabbit is employed as a means of determining whether such tissue is tuberculous. About twenty or thirty days after the injection into the eye, small, reddish grey nodules make their appearance in the iris and the eye becomes inflamed. The nodules increase in number, coalesce and fill the anterior chamber with a mass of new tissue. The cornea becomes involved and the growth breaks through, thus destroying the eye. The animal usually dies from general tuberculosis.

Tuberculosis of the iris manifests itself in three forms:

First, Solitary Tubercle.

Second, Disseminated Tubercle.

Third, Simple, inflammatory tuberculous iritis (Michel).

The solitary growth affects one eye alone and develops as a small, round or oval nodule, usually at the periphery of the lower part of the iris. It is grayish red in color, and as it grows it fills the anterior chamber of the eye, and much resembles a neoplasm. Indeed such a mass may easily be taken for a sarcoma. This also goes by the name of granuloma, a term, according to Fuchs, that was given by von Graefe, "because Virchow who made the anatomical examination of the tumor designated it as granulation tissue." This term should be abandoned, for it is misleading and liable to create

confusion. As the growth increases, the cornea becomes involved and perforates, allowing the mass to break through, which presents as a pale yellowish or grayish mass similar in appearance to granulation tissue. It does not then continue to grow, but breaks down, and the eyeball gradually begins to shrink as the inflammatory process occasioned by the growth subsides. The eye is, of course, lost and phthisis bulbi ensues. General tuberculosis infection may result.

In the disseminated form which may occur in one or in both eyes, there are at first all the symptoms and signs of an iritis. Soon little yellowish grey nodules surrounded by a slightly reddened zone, appear in the iris. These vary in size according to the growth, but are from one to six mm. in diameter. Their favorite site is at the root or periphery of the iris, and they seem to be constantly changing, some disappearing while others are forming. Their predilection for the outer or root zone of the iris helps to distinguish them from the condylomatous nodules, so frequent in syphilitic iritis that usually are seen at the pupillary margin. Graefe describes them as of the size of millet seeds, distributed over the iris, especially over its lower half and some distance from the pupillary margin on the *circulus arteriosus minor*. Some of these tubercles may disappear completely, leaving small patches of atrophied iris, while others may coalesce, forming larger tuberculous masses that fill-in the angle of the anterior chamber.

The iris is dull and discolored, and flakes of lymph and disintegrated tuberculous nodules may fill-in and occlude the pupil. Firm and extensive adhesions form between the iris and the lens, and the tension of the eye may become markedly increased. Lubrowski (*Archives of Ophthalmology*, Vol. XXIX, No. 3) reports several cases in which glaucoma supervened. Ciliary injection is marked and the eye is very often sensitive to pressure. The ciliary body and choroid may be invaded, and even the cornea may be involved, the tubercles presenting the same general appearance in that structure as in the iris.

As the case progresses, there may be bulging of the ciliary region and even perforation; or the process may subside with gradual shrinking and atrophy of the eyeball. Tuber-

cular meningitis or general tuberculosis may supervene, so that the prognosis, both general and local, is bad.

In the third form, according to Michel, the tubercles are not clinically demonstrable, being situated in the tissue of the iris and not on the surface. The disease assumes the form of a chronic iritis or irido-cyclitis, which causes either complete annular posterior synechia of the iris, or adhesion of its posterior surface to the lens. In the former, there would be iris bombée and more or less atrophy of the tissue of the iris. In the latter form there is proliferating inflammation of the iris which becomes hypertrophied, and granulation tissue fills the posterior chamber. The tuberculous nature of the trouble may be demonstrated by excising a piece of the iris and examining it microscopically for the existence of tubercle. Deposits of lime are frequently found in such irides, and even true bone formation has been observed as in the choroid.

Some observers, Leber (*Bericht der XXI. Versammlung d. Ophthalmol. Gesellsch.*, Heidelberg, 1891), Samelssohn (*Bericht der XXIII. Versammlung der Ophthalmolog. Gesellsch.*, Heidelberg, 1893), and Van Duyse (*Archiv. d' Ophthalmologie*, XII, p. 478), describe a form of attenuated tuberculous iritis, presenting all the salient features of the disseminated form, which may end in spontaneous recovery, the functions of the eye being partly or wholly preserved. This form is slower in its course and affects older persons.

All of the forms mentioned present the same histological features, differing in degree, namely the typical tubercle formation of round cells around a central giant cell. This giant cell is a large crescentic or round structure with non-granular protoplasm, containing near its periphery numerous elongated nuclei. The little tubercle mass is frequently seen on the wall of a vessel, and develops from the adventitia. This is one means of differentiating histologically a tubercular from a syphilitic node, for in the latter the growth begins in the intima and the lumen of the vessel is blocked. In the milder forms of the disease, the bacilli are very scarce and difficult to find. It is assumed, therefore, that in some of these cases the exciting cause is not so much the direct action of the bacilli as it is the irritation caused by the toxines generated by them, circulating through the delicate tissue of the

iris, which, for some reason, is unusually sensitive and susceptible.

This is a disease of childhood and adolescence, the large majority of such patients being under the age of twenty years. Of 121 cases reviewed by Schieck (*Graefe's Archiv. für Ophthalmologie*, Bd. 50, part 2, 1900) ninety-six were under the age of 20 years; while of the remaining 25, only six were over thirty years. The oldest was 55.

Most of the patients affected with tuberculous iritis have either pulmonary tuberculosis or tuberculous manifestations in other structures, such as joints, lymphatic glands or skin. Some have a bad family history, while a few have neither a family nor a personal history of tuberculosis, nor do they show any manifest signs of the disease, except in the lesion of the eye. Such cases raise the very interesting and important question, whether the iritis is primary or secondary to some other tuberculous lesion, and many capable observers take the view that it is primary. It is argued that the eye of a sound person may be infected locally through an abrasion of the cornea, or an ulcer of the cornea or conjunctiva, and that in such manner the bacilli may gain entrance to the deeper circulation of the eye.

#### DISCUSSION.

DR. ALT.—Tuberculosis of the iris is a comparatively rare disease, although possibly more frequent than we know. The statement that from 40 to 50 per cent. of iritis are tuberculous, seems to be based on the paper of Michel, published in Graefe's Archives some 18 or 20 years ago, in which he tried to show that in iritis the inflammation is always a nodular one. At a certain stage this is really the case in many forms of iritis, but while the picture is suggestive of tubercles, these are not tubercles. It is due to the accumulation of leucocytes around all or at least a large number of the very many blood-vessels in the iris. While the specimens shown by the essayist are very fine and characteristic I believe that in modern times the diagnosis of tuberculous iritis is often made without a warrant. Personally, I have not yet seen a case, although I have seen some specimens which were certainly tuberculous.

DR. SUKER.—I would like to ask whether in the so-called acute variety the arrangement of the tubercles and cells is



similar to that in chronic tuberculosis, and whether or not the coalescence in the iris is as marked as in the single tubercles of the choroid. My experience in tuberculosis of the iris has been mainly experimental. If any of you wish to try it, you can take a small syringe and through a small corneal incision inject a pure culture of the germ. In 34 hours or later you will see the characteristic growth begin and you can watch it nicely. Rabbits are especially susceptible.

DR. JOS. BECK, Chicago.—This case of Dr. Wilder interests me particularly from the histo-pathological point of view. I have been studying this specimen microscopically and have found some beautiful giant cells, characteristic of tuberculosis. I had the pleasure of seeing tubercular iritis and irido-choroiditis at Graefe's and Wintersteiner's laboratories. The differential diagnosis between syphilitic and tubercular iritis based on the presence of giant cells, when found alone, is not absolute, because one can find them in both the conditions. The endarteriitis obliterans in syphilis and the periarteriitis in tuberculosis are points of greater diagnostic value. Another point in the diagnosis is the reaction to tuberculin, which was not mentioned in the writer's paper, I believe. In Elschnig's case of tubercular irido-choroiditis the experiments with tuberculin were carried out and a reaction obtained.

DR. M. D. STEVENSON, Akron, O.—It is clinically important but often difficult to differentiate between tubercular nodules, condylomata and sarcomata. The former usually occur in young people with a tubercular history and their size, peculiar grayish white or yellowish gray color, and lack of bloodvessels help to distinguish them. The condylomata occurring in older people, with a history or signs of lues are usually quite small and vascular and quickly disappear under specific treatment. Non-pigmented sarcoma in old people is always single and very vascular, it steadily increases in size and never disappears. Microscopically this can be easily differentiated although all of the tumors may have giant cells. It is important to note whether the inner or outer coats of the vessels are chiefly affected.

DR. WILDER (closing).—In reference to the point raised as to the giant cell and its differentiation from the giant cell of syphilis, one must bear in mind there are several varieties



of new growth in which the giant cells may be found. They are found also in sarcoma and may make one think of tuberculosis. But there is a way of telling them apart: the giant cell of tuberculosis is usually circular in outline or elliptical, rather symmetrical, while that of sarcoma is more angular, and irregular. It is the same in syphilitic forms. Another point is that the contents of the giant cell of tuberculosis are clear and non-granular, while those of sarcoma are granular. Also, the nuclei in the tubercular giant cell are peripheral and usually elongated, while the others are central. Another important differential histologic point is that in tuberculosis the growth begins in the adventitia, while in syphilis the process usually starts in the intima of the vessels. In regard to the reaction of tuberculin, I think it uncertain, at least it has been so in the limited experience I have had. I have had two cases in my own practice where there was no reaction after the use of tuberculin.

(Dr. Wilder showed a number of microscopical specimens).

#### MYDRIATICS IN REFRACTION OF PRESBYOPES.\*

By O. A. GRIFFIN, M. D.

ANN ARBOR.

Formerly Demonstrator of Oto-Laryngology, University of Michigan, etc., etc.

SINCE the introduction of cycloplegics into refractive work, there has strangely existed, among ophthalmologists, a great diversity of opinion as to the necessity and advisability of employing these drugs as an aid in the determination of ametropic conditions. These contentions have been confined more particularly to the propriety of their use in the refraction of adults, while their employment in testing the presbyopic ametropes seems to be quite generally regarded as not only superfluous but attended with risk of inducing a glaucomatous condition. With a view of eliciting an animated discussion upon these points, I beg to present a few remarks upon the use of mydriatics in the refraction of presbyopic eyes.

When a patient presents himself for relief from an ametropic eye strain, be he young or old, the same difficulties of

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making an accurate estimation of the refractive condition of the eye, without the aid of a mydriatic, obtain to a greater or less degree. The variability in refraction of an accomodating eye, the dependence of a subjective test upon the uncertainty of a patient's judgment, the frequent latency of hyperopic conditions, the fact that a sphere will improve to a certain extent the vision in astigmatism (although this phenomenon is denied by many writers upon refraction), the additional observation that 90 per cent. of my refractive cases are astigmatic, one-quarter of a diopter or more, and most important, an inability of properly employing the objective tests as a means of corroboration have convinced me, after making several thousand refractions, that the aid of a cycloplegiac is not only necessary to the accomplishment of an accurate refraction of the young adult, but may be frequently employed with profit in the testing of presbyopic ametropes. Frequently is the statement made that it is not necessary to correct the smaller degrees of astigmatism when prescribing for an ametropic defect in the presbyopic. Such reasoning seems to be pregnant with anything but logical thought. With as much propriety might a physician consider his duty performed after administering a quieting potion to relieve a chronic disorder. If it is necessary to correct an ametropia at all, why burden a patient with a glass that removes only a portion of his trouble, when every vestige of strain and discomfort might be eradicated thereby? It is frequently the presence or absence of these small defects that decides the comfort of the patient.

To briefly illustrate the validity of my position with reference to this subject, I will cite a few instances in which a satisfactory refraction was not obtained until a mydriatic was used, when both the subjective and objective methods of testing were employed, the findings of the latter being usually preferred.

CASE 1. Mrs. C. R. W., aet. 49, consulted me for the relief of marked refractive symptoms from which she had suffered for several years, although she had repeatedly been fitted with glasses by different oculists. Vision was normal, conjunctiva chronically injected, blepharitis marginalis present, and general health greatly impaired. When she called upon me, she was wearing +1.00 sph. before each eye.

Without a mydriatic she accepted O. D. +1.00 sph. +0.25 cyl. ax. 60°; O. S. +1.00 sph. +0.25 cyl. ax. 120°. Not obtaining complete comfort from the use of these lenses, the eyes were homatropinized, when +0.75 sph. +0.50 cyl. ax. 60° was selected for the right eye, and +0.88 sph. +0.37 cyl. ax. 120° for the left, which was worked out principally by means of the skiascope, as the subjective tests were uncertain. An additional +1.50 sph. was given her for reading, with instructions to wear the distance glasses constantly. Though several years have elapsed, this same ametropic correction is being worn with complete satisfaction, and attended with a marked improvement of her physical condition.

CASE 2. Mrs. R. C., aet. 66, was referred to me by her physician for refraction. She had been unable to obtain relief from constant headaches and blurring of print from which she had suffered for two years, although she had worn several different lenses. Vision in O. U.,  $\frac{20}{60}$ , was improved to  $\frac{20}{20}$  by a 2.25 sph., which she was wearing. A subjective test, without a mydriatic, was attended with uncertainty as to the exact amount and axes of the existing astigmatism. Under homatropin, both of these points were decided without any difficulty, when she accepted in O. D. +2.00 sph. +0.75 cyl. ax. 180°, and in O. S. +2.00 sph. +0.50 cyl. ax. 180°, which was corroborated by the shadow test, giving a vision of  $\frac{20}{15}$  in each eye. A +3.00 sph. was added in a pair of grab fronts for her presbyopic condition. Complete relief from her symptoms has been enjoyed since wearing these corrections during the past two years.

CASE 3. J. F. S., aet. 60, since a young man has had poor distant vision, pain in eyes, and blurring on reading, from which he has never been relieved, although he has often been fitted by several refractionists. Vision was  $\frac{9}{200}$  in O. D., and  $\frac{8}{200}$  in O. S. Was wearing -6.00 sph. for distance and -4.00 for reading. Subjective tests gave -6.00 sph. -1.50 cyl. ax. 115° for the right eye, while -7.00 sph. -1.50 cyl. ax. 60° was selected for the left, giving  $\frac{20}{60}$  in O. U. A deduction of 3.00 diopters was given him for reading. After a trial of these lenses, which was not satisfactory, homatropin was instilled, when objective tests showed that the proper correction for the right eye was -6.00 sph. -2.50 cyl. ax. 120°, and -7.00 sph. -2.00 cyl. ax. 60° for the left,

which gave a vision of  $20/40$ . Together with an appropriate correction for near work, these corrections have produced a cessation of all his refractive symptoms since wearing them.

If space permitted, these typical cases might be augmented by the citation of a large number of similar instances, which have come under my observation and care. The difficulties of making subjective estimations as previously indicated are all illustrated by the above cases, and as the presbyopes, whom I usually meet, are from a distance and have generally consulted refractionists of more or less ability, if the usual methods of testing show any uncertainty in results, I do not hesitate to place them under the influence of homatropin, when a certainty of refraction is apparent. In following this procedure, I am actuated by a desire to please my patients in the removal of their distressing symptoms, and thereby further my reputation.

In regard to the risk incurred by the employment of homatropin in presbyopic eyes, it is scarcely necessary to add that, in my opinion, this matter has been greatly exaggerated by many writers, although as a routine, I employ a myotic to neutralize the effect of the mydriatic. Among the thousands of presbyopes, who, in clinical and private practice, have had *atropin* instilled into their eyes for weeks and even months at a time in the treatment of corneal and iritic disorders, how many have terminated in a glaucomatous condition? We employ mydriatics in these conditions with scarcely a thought of danger, but when suggested as an aid in the refraction of presbyopic ametropes, what a potency for harm it suddenly assumes in the minds of some! A reference to the literature of glaucoma reveals the citations of many instances resulting from the use of mydriatics, while a further search will show that cases have followed the instillation of eserine. Such contradictory evidence to my mind points to the purely incidental development of the glaucomatous state. Our present knowledge of the etiology, pathology, and in many respects even the treatment is quite uncertain as will be found upon investigation of the writings at hand, and until our knowledge upon these cardinal points becomes more definite and certain, can these harmful properties be justly attributed to the employment of mydriatics? I have yet to meet an instance in which the supposed increase of tension, or any other deleter-

ious condition has resulted from my use of the drug, either as a mydriatic or cycloplegiac. If the agent is employed as I have previously indicated, followed by a myotic, I am confident that our results in the refraction of presbyopic ametropes would prove more satisfactory, and the risk incurred practically nil.

## DISCUSSION.

DR. SUKER.—This question of mydriatics is very interesting. I am glad to know that the doctor has become so expert that he can recognize with the retinoscope the difference between  $\frac{1}{4}$  and  $\frac{1}{8}$  diopter of astigmatism.

In regard to using atropine, as I have already stated, the ciliary muscle is constantly active; it does not undergo the sclerosis the lens undergoes. Therefore, the ciliary muscle, though still active, can not change the convexity of the lens. Beyond 65 years of age we know that atropine has no effect upon the manifest accommodation. The lens does not expand in its anterior-posterior diameter, though the ciliary muscle may or may not be paralyzed. Hence, if you get a complete paralysis, the refractive condition is not changed and the range of accommodation is not changed; therefore there is no reason for using atropine in these cases. Beyond the age of 45 I see no legitimate reason for the use of atropine in determining any kind of refractive error, excepting a temporary mydriasis for retinoscopic purposes.

DR. BRADFIELD.—I have no fault to find with the thorough examinations in refraction. It may rarely be necessary to use a cycloplegic after fifty years of age, but when done I insist that the proper glasses must be selected after the cyclopegia has entirely disappeared.

All the result produced by correcting low degrees of astigmatism in the presbyope, wearing plus 2.00 or stronger spheres, is purely in the mind of the operator, as a slight tilting of the glasses will much more than counteract the effect.

DR. MINOR.—I am very glad to hear the paper, for the doctor finally come to my way of thinking, after all. He did not agree with me last year when I said that I invariably used homatropin in every case of refraction, no difference about the age of the patient. I have yet the first time to find an increase of tension produced by it. I have read about it,



but although I have looked for it, I have never found it. The doctor told me that very often, if not always, he uses a drop or two of eserine in these presbyopes after the homatropin. This I do not find necessary. As for correcting astigmatic defects, I think this is highly necessary, and that is where the careful refractionist gets the good results in his work. I have cases every week refracted by other men who disregard this astigmatism, and I find that if I correct  $\frac{1}{2}$  or  $\frac{1}{4}$  diopter of astigmatism that the glasses are satisfactory to the patient.

DR. GAMBLE.—I think that the conclusions of Dr. Griffin's paper should be emphasized, and I believe thoroughly in every conclusion he has reached. I am not speaking from a theoretical point of view but from a clinical one. It has been my custom for two years to put homatropin in every presbyopic eye that comes to my office to be fitted. If there is any evidence of astigmatism, unless there is some contraindication. I think the use of homatropin is especially valuable in determining the required lenses in presbyopic cases for the purpose of revealing the astigmatism. I never feel sure the patient has a perfectly fitting lens until I have used the retinoscope. It is difficult to get a subjective test revealing the amount and axis of astigmatism, which is accurate. It differs with the personal equation of each patient. I do not see any objection to using the objective method, and you cannot get this without a cycloplegic. When through, you have the best possible result that can be attained.

DR. M. D. STEVENSON, Akron, O.—Always feels greater confidence in his result after the use of homatropin in presbyopes, and especially when he also gives a post-cycloplegic examination. He does not use it in all cases, and never when contraindicated by increased eyeball tension. His method is to instill ten or twelve drops of a 1 per cent solution in the eyes every five minutes (the patient waiting in a quite dark room), and commence the examination in from fifteen to thirty minutes after the instillation of the last drop. No trouble has so far resulted from their use, although eserine has occasionally been used after the examination as a preventive. Most all presbyopes have some accommodative power, and, if hyperopes, will usually demand too weak a lens. In photostcopy which the writer considers much the best objective method of examination, the refractive strengths of these



eyes without the use of a cycloplegic, are often noticed to vary much depending on their accommodation.

DR. GRIFFIN (closing discussion).—Dr. Suker compliments me upon my ability to diagnose between  $\frac{1}{4}$  and  $\frac{1}{8}$  diopter with the skiascope. I do not consider this as anything extraordinary, although I must say that these results are not obtained by a careless use of the method. Accuracy in this mode of testing is a matter of personal equation as in other methods of refraction. With the eye under a cycloplegic, I first use the subjective tests, and then the shadow method. In a comparison of results, with few exceptions, the patient accepts my findings of skiascopy as the best. This is not due to careless use of the subjective tests, but to the uncertainty of a patient's judgment. Normal vision through a lens, with or without a complete suspension of the accommodation, does not positively exclude a remaining ametropia. The doctor tells us that at 65 years of age the accommodation is suspended physiologically, but theory is one thing and facts are another. I have had patients 65 years of age where I could not make a reliable refraction without the use of a mydriatic; and even at 70, I have observed a variability in the tests. I recall a patient of 50 years, who complained of marked refraction symptoms, but so far as the subjective tests were concerned, no error was evident; though under homatropine, a compound hyperopic astigmatic condition of moderate degree was easily shown. Dr. Bradfield says that the patient does not accept the correction made under a mydriatic and the dilated pupil presents a different refraction than a normally contracted one. That is true in some instances of marked spherical aberration, but I overcome this defect by employing a perforated disc as previously indicated, whereby a central refraction corresponding to the normal pupil is made. Of course, that is done as a last test, when finally deciding between the subjective and objective findings. It is results that speak. It may sound all right to say that it is not necessary to correct  $\frac{1}{4}$  to  $\frac{1}{8}$  diopter of astigmatism in aged people; but when they come to the refractionist without this correction, and a remedying of these small defects results in a perfect cessation of the patient's former symptoms, which continues for years, I contend that it is not all imagination that produces these results. Again I say, results speak for themselves.

KERATOCONUS, ÆTIOLOGY, AND IMPORTANCE OF  
EARLY DIAGNOSIS AND TREATMENT.\*

BY J. A. L. BRADFELD,

LA CROSSE, WIS.

EARLY in my experience in special work my attention was very forcibly called to the meagerness of the articles in our text books on the subject of keratoconus and the paucity of the subject in our general medical literature. Time has convinced me that it is much more frequent and of more importance than generally considered.

I do not come before you with a large clinical experience all classified and tabulated, but will deal with the subject from my own experience; and if, after the reading of this, the paper is unhesitatingly criticized and the subject thoroughly discussed, the object of the writer will have been accomplished.

The paper will be limited to the typical keratoconus characterized by ecstasia of the cornea just below and to the inner side of the optical center. Keratoconus is a disease having its origin at puberty and characterized by asthenopia and gradual failing of vision both far and near. It occurs more frequently in the female, is usually binocular and often originates in the hypermetrope. In many cases it soon reaches a stasis and leaves only a slight irregular astigmatism to mark its demise. In others it is much more serious, leaving not only a slight cone, but great irregular astigmatism with myopia and accompanying low vision; while the exaggerated cases have a well marked cone protruding between the lids and almost blindness.

It is sometimes found in the rhachitic subject, but oftener in the nervous, chlorotic individual, and some fault with the general system is always present. The nervous phenomena common to puberty being the most important.

The specific ætiology is unknown. The intraocular tension is not above normal and the thinning of the cornea results from the increase in area and corresponding thinning of the membrane. There being a fault in the general nutrition of the eye, the tonicity of the cornea is insufficient to resist the

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normal intraocular pressure, and hence the giving away of the least protected portion of the organ by the palpebra and extrinsic muscle of the eye, which is the point just below and to the inner side of the center of the cornea.

When the process has once begun the error of refraction resulting therefrom causing increased effort at accommodation, increases the progress of the disease, which, if the cause is not removed, hastens the eye to destruction.

When the disease is well advanced the diagnosis is easily made by the dark disc in the pupil reflex, the small and irregular corneal reflex or the irregularity of the rings in Placido's disc. When the ectasia becomes a staphyloma it can easily be seen, as it protrudes between the lids.

As the success in treatment depends on an early diagnosis which is very easily omitted, finer points in diagnosis must be found. As the center of the ectasiæ always occurs to one side of the optical center of the cornea, astigmatism is always present and also the meridians of least and greatest curvature are not at right angles. It is here that the ophthalmometer is invaluable. It not only shows the astigmatism, the variations from right angles of the principal meridians, but the variations with different stages of dilatation of the pupil and the course of the disease whether progressing, retrograding or at a stasis.

When vision and refraction are found to vary with different sizes of the pupil, accompanied by variation in the location of the axes of the cylinders, keratoconus should be suspected and can only be confounded with keratectasia, resulting from corneal lesions, the history of which is generally sufficient to determine the diagnosis, but when not, a little time and careful observation will do so.

With an early diagnosis and appropriate treatment, prognosis is good, the disease not only being brought to a stasis but considerable ectasia reduced to normal cornea. When more advanced, much improvement can be made, but vision will not be brought back to normal with correction of refraction, and ocular weakness will always remain.

When well advanced and the ectasia has become a perceptible cone, treatment yet is very valuable, but the preservation of good and comfortable vision is not possible.

Treatment should begin by correcting any errors in the general health and following good hygienic principles. Second, rest of the eyes from all use requiring prolonged accommodation. Third, correction of errors of refraction by appropriate lenses. Here care and judgment is required, as the refraction will vary very greatly with the different stages of dilatation of the pupil. The proper glasses should always be determined without the use of a mydriatic, care being taken to have about the same degree of light as in which the patient will work. Owing to contraction of the pupils in accommodation, sometimes very different lenses are required for distant and near use. In the early stages when the ectasia is progressing or retrograding, frequent changes of lenses will often be needed. Plus cylinders are usually but not always best.

In the early stages before the cornea has become very much thinned, local applications of the crystal of alum should be made to the affected portion of the cornea. After cocainizing the cornea a smooth piece of alum should be gently passed over the cornea from one to half a dozen times, as experience teaches. This leaves a very soothing sensation and should be continued from once a day to two or three times a week till the ectasia is reduced or no longer improves. If after treatment is stopped the ectasia should return, the same treatment should be continued.

In the more advanced stage when the cone becomes visible and the center thinned, myotics and iridectomy are valuable but cauterization penetrating the entire thickness of the cornea is much more valuable, subsequently making iridectomy where it will give the best optical results.

To summarize: Keratoconus is often a self limiting disease. In the early stages the process can not only be stopped, but the resulting ectasia reduced and sometimes entirely removed, leaving a normal eye. When advanced the trouble can only be ameliorated and good vision never restored. When a high degree of ectasia has occurred, but poor vision at best can be preserved. Hence the importance of an early diagnosis and of acquainting the subject with the seriousness of the disease and of the importance of early and thorough treatment.

## BOOK REVIEWS.

1. FESTSCHRIFT FUER GEHEIMRAT, PROF. D. V. MANZ, Freiburg, AND GEHEIMRAT, PROF. D. H. SATTLER, Leipzig. BEILAGEHEFT ZUM XLI. JAHRGANG DER KLINISCHEN MONATSBLAETTER FUER AUGENHEILKUNDE. Stuttgart, 1903. Ferdinand Enke. Price 14 marks. (COMPLIMENTARY NUMBER. A SUPPLEMENT TO THE XLth VOLUME OF THE KLIN. MONATSBLAETTER.)

This number consists of two parts, one as a congratulation offering to Professor Manz at his 70th birthday, and one in commemoration of the 25th anniversary of Professor Sattler's professorship. Most of the papers are written by the former pupils and assistants at the eye clinics of Freiburg and Leipzig. The numerous subjects treated are of the greatest interest and refer to the histology, pathology and physiology of the eye. The illustrations (34 in the text and 19 plates) are excellent. Every oculist should study these important contributions to our literature.

2. SQUINT, ITS CAUSES, PATHOLOGY AND TREATMENT. By CLAUDE WORTH, F.R.C.S., London, 1903. John Bale, Sons & Daniellson. Price 6 shillings.

This is an interesting and very complete text-book on squint, with many original points and a description of the author's own method of muscular advancement. The illustrations are numerous and useful; by one of those strange mishaps in printing and proofreading the author's own original drawing on page 208 happens to be upside down. A large number of cases are cited in elucidation of the points set forth. Students and oculists will read this book to great advantage.

- THERAPIE DER AUGENKRANKHEITEN (Ocular Therapeutics),  
By DR. VICTOR HANKE. Wien & Leipzig, 1903. Alfred Holder. Price 3,20 marks.

In this little book the first assistant of Prof. Fuchs' Clinic in Vienna has presented the manner in which the different affections of the eye are treated at this clinic. Such a

little book cannot fail to prove of great interest, and students and physicians will find it an excellent guide both as to diagnosis and treatment of the various eye affections.

**MANUAL OF THE DISEASES OF THE EYE FOR STUDENTS AND GENERAL PRACTITIONERS.** By CHAS. H. MAY, M. D. Third edition, revised. William Wood & Co., New York, 1903. Price \$2.00.

If the rapid sale and popularity of a book are an index as to its intrinsic value — and with scientific works this is probably the case — the author of this Text-book can certainly feel gratified, as this is the 3d. edition of the book, the first appearance of which we noticed in 1900. Numerous alterations and additions and some new illustrations make it more useful even than it was.

**DISEASES OF THE EAR. A TEXTBOOK FOR THE PRACTITIONERS AND STUDENTS OF MEDICINE.** By E. B. DENCH, Ph. B., M. D. Third edition, revised and enlarged. New York and London, 1903. D. Appleton & Co.

This new edition of the well-known textbook deserves the same success its predecessors have had. It is an exhaustive treatise not only for students and practitioners of medicine as the title modestly states, but for students of practitioners of otology more especially. It needs no praise from us.

**ARTERIA UTERINA OVARICA. THE UTERO-OVARIAN ARTERY OR THE GENITAL VASCULAR CIRCLE.** By BYRON ROBINSON, B. S., M. D. Chicago, 1903. E. H. Colegrove. Price \$1.00.

An excellent description of the anatomical relations of the utero-ovarian artery, with very numerous and mostly excellent illustrations. No pains seem to have been spared to make the subject clear and the result of the author's careful labors is this atlas which should be in every surgeon's library.